Appendix A. Rock-Sample Database, Nevada Test Site and Vicinity, Nye County, Nevada

Rock-sample data were catalogued for nearly 2,600 holes drilled and mined at the NTS and vicinity. Appendix A data are available at URL: http://pubs.usgs.gov/ds/2007/297/.

Table A1. Description of Rock-Sample Database column contents.

[**Abbreviations:** DOD, U.S. Department of Defense; DOE, U.S. Department of Energy; NTS, Nevada Test Site; NWIS, National Water Information System; USGS, U.S. Geological Survey; ft, foot; –, not applicable]

Column heading	Column code	Column explanation
USGS NTS sort order	–	Emplacement and exploratory holes typically are displayed together. Many sites also have multiple completion intervals within the same hole. Therefore, a sort order number is assigned to all USGS sites associated with DOE and/or DOD projects in Nevada. This field is modified as new sites are added.
USGS NTS unique number	–	Spatial (*X*-*Y*) coordinates are unavailable at some locations. Therefore, USGS site identification numbers cannot be established in the USGS NWIS database Sitefile for these sites. Because NWIS site identification numbers cannot be assigned to all sites, it is necessary to assign a unique site number to all USGS sites associated with USGS DOE/DOD projects in Nevada. Although the unique numbers were initially assigned in the same order as the USGS NTS sort order, new sites are assigned the next available sequential number.
NTS area	–	NTS Administrative Area number (see fig. 1). Entries are listed in **bold** type where sites are located in areas other than the hole name implies. For example, USGS hole name **U - 2bw** is actually located in NTS area **09**.
USGS hole name	–	USGS hole name designation. Entries are listed in **bold** type where sites are located in areas other than the hole name implies.
Sample interval number	–	Sequence of sample interval.
Sample interval top (ft)	–	Depth to top of sample interval; in feet below land surface for boreholes and shafts; in feet from portal opening for tunnels and drifts.
Sample interval bottom (ft)	–	Depth to bottom of sample interval; in feet below land surface for boreholes and shafts; in feet from portal opening for tunnels and drifts.
Sample interval sequence number	–	Sequence of samples, when multiple samples are reported within a sample interval.
Number of samples	–	Number of samples for rock-sample interval. Sample types (described below) have a direct bearing on number of samples reported. Auger, core, and cuttings samples are treated as continuous and the number of samples is reported as 1 unless auger or cuttings samples are split into separate boxes for various preservation and storage types or adjacent core samples are collected from the same depth interval within a hole. Drill cuttings are normally collected at regular 10-foot intervals throughout the drilling process. However, cuttings may be skipped or may be collected at other intervals. Also, core often is not fully recovered in the drilling process. These gaps in continuity are noted by investigators during sample interpretation and analysis. Normally missing core and cuttings intervals are minimal and not recorded in this table.
Sample type	–	Type of sample.
Sample type	Auger	Collected from a screw-like boring tool and normally collected from unconsolidated material. Accuracy is approximate.
Sample type	Core	A cylindrical piece of solid rock taken by a special hollow-type drill bit. Cores are usually about 3 inches in diameter and range from a few inches to several feet in length.
Sample type	Core, 12-inch	Core, 12-inch diameter sample.
Sample type	Core, 6-inch	Core, 6-inch diameter sample.
Sample type	Cuttings	Rock chips or fragments produced by drilling and brought to the surface.
Sample type	Cuttings, unwashed	Cuttings, unwashed sample. Stored as collected.

Table A1. Description of Rock-Sample Database column contents.—Continued

[**Abbreviations:** DOD, U.S. Department of Defense; DOE, U.S. Department of Energy; NTS, Nevada Test Site; NWIS, National Water Information System; USGS, U.S. Geological Survey; ft, foot; –, not applicable]

Column heading	Column code	Column explanation
Sample type	Cuttings, washed	Cuttings, washed sample. Drill cuttings often contain various forms of debris, drilling mud, and other contaminants when collected. Samples are placed in a sieve and rinsed with clear running water in an attempt to remove foreign matter prior to permanent storage.
Sample type	Drill-bit	Drill-bit sample collected by gouging out rock chips or mud from the cutting parts of a drill bit while the bit is out of the hole.
Sample type	Grab	These fist-sized samples come from shafts and tunnels. Samples pried from walls are accurate to about a foot. Samples taken from debris piles are accurate to about 10 ft.
Sample type	None	No samples.
Sample type	Sidewall	These finger-sized samples are collected by shooting or drilling a plug of rock from the wall of an uncased hole. Accuracy is about a foot.
Sample type	Wax	Core samples are coated with wax in an attempt to preserve natural-state conditions. Samples are wrapped with heavy gage aluminum foil then dipped in melted bee's wax. Wax is usually built up in several layers to about 1/16 inch.
Sample owner	–	These organizations collected and have proprietary interest in the samples. **Each organization must be contacted for permission to view and/or analyze their samples.**
Sample owner	DOE	U.S. Department of Energy (DOE)
Sample owner	DOE/NSTec	DOE/National Security Technologies, LLC (NSTec; formerly owned by Bechtel, Nevada (BN); formerly owned by Reynolds Electrical and Engineering Co. (REECo)).
Sample owner	DOE/ER	DOE/Environmental Restoration Program (ER).
Sample owner	DTRA	DOD, Defense Threat Reduction Agency (DTRA).
Sample owner	LANL	Los Alamos National Laboratory (LANL).
Sample owner	LANL/JVE	LANL/Joint Verification Experiment (JVE).
Sample owner	LLNL	Lawrence Livermore National Laboratory (LLNL).
Sample owner	LLNL and DTRA	LLNL and Defense Threat Reduction Agency (DTRA).
Sample owner	LLNL/SNL	LLNL/Sandia National Laboratories (SNL).
Sample owner	PD	Public Display (PD).
Sample owner	USGS	U.S. Geological Survey (USGS).
Comments	–	Comments pertaining to rock-sample interval.
Comments	Bottom hole core	A rock chip or core sample taken from bottom of borehole. Used to confirm rock unit where hole bottomed.
Comments	Rubber sleeve core	A thick-walled rubber cylinder is used as a "core catcher" to collect unconsolidated material while using a core bit. The rubber sleeve confines the material keeping it in the order collected.
Comments	Paleo	Refers to drill cuttings collected for paleontological age dating studies.
Additional sample collection	–	Samples collected following initial drilling or excavation.
Sample range top (ft)	–	Depth to top of first sample interval; in feet below land surface for boreholes and shafts; in feet from portal opening for tunnels and drifts.
Sample range bottom (ft)	–	Depth to bottom of last sample interval; in feet below land surface for boreholes and shafts; in feet from portal opening for tunnels and drifts.
Number of boxes	–	Total number of standard sample boxes for hole. Standard sample box dimensions are 13 inches wide by 2 feet 6 inches deep. Height varies from 2 1/2 to 3 3/4 inches. Cardboard core-sample liners are 3 inches (4 per standard storage box), 3 1/2 inches (3 per standard storage box), and 5 1/4 inches (2 per standard storage box) in height. Therefore, standard storage box heights can increase to 5 1/2 inches. Most cuttings-sample boxes are 2 1/2 inches wide by 3 7/8 inches deep by 1 3/8 inches high. Standard storage boxes will accommodate 70 cuttings-sample boxes (5 rows by 7 rows, stacked 2 high). Because the majority of cuttings samples are collected every 10 feet, this represents 700 feet of hole. Cuttings-sample boxes used for Environmental Restoration Project (ER) holes are 4 1/4 inches wide by 4 1/4 inches deep by 2 inches high. Standard storage boxes will accommodate 42 ER cuttings-sample boxes (3 rows by 7 rows, stacked 2 high). Furthermore, oversized 6- and 12-inch cores are stored in wooden crates.

Table A1. Description of Rock-Sample Database column contents.—Continued

[**Abbreviations:** DOD, U.S. Department of Defense; DOE, U.S. Department of Energy; NTS, Nevada Test Site; NWIS, National Water Information System; USGS, U.S. Geological Survey; ft, foot; –, not applicable]

Column heading	Column code	Column explanation
Sample box name	–	Name written on sample box located at USGS Core Library in Mercury, Nevada. Entries are listed in **bold** type where sites are located in areas other than the hole name implies.
Sample rack-column-shelf number	–	Samples are stored in two types of storage racks. Rack number 1 was removed, so racks are numbered from 2-99. Open racks are 7 bays high and have bay openings that are 14 inches wide by 18 inches high by 2 feet 6 inches deep to accommodate standard storage boxes. Samples are ordered in bays from left to right as A-Z and AA-RR and from bottom to top as 1-7. Examples of open rack numbers are: 02-A-1 (bottom bay on left side of rack number 2) and 91-RR-6 (bay 6 on right side of rack 91). Most pallet racks are 3 bays high and have bay openings that are 46 inches wide and accommodate 1 pallet containing 3 standard storage boxes side by side. However some pallet racks are 4 bays high and newer pallet racks are 91 inches wide and accommodate 2 pallets containing 6 standard storage boxes side by side. Height varies from 36-54 inches high and depth is over 5 feet to accommodate 2 pallets (one behind the other). Samples are ordered on pallets in bays from left to right as 1-14 and from bottom to top as A-D. Examples of pallet rack numbers are: 89- 1-A-R (bottom rear bay in bay 1 on left side of rack 89) and 83- 8-D-F (top front bay in bay 8 of rack 83). Furthermore, a few odd sized samples are located on pallets or in wooden crates and stored on the floor at the end of the open or pallet racks. These locations are given an imaginary bay notation. For example rack 14 ends at bay K and rack 85 ends at bay 11. The space between the end of these racks and the building wall is denoted as an additional bay: 14- L-1 or 85-12-A-F.
Sample pallet number	–	Sample pallets are of sufficient width to accommodate 3 standard storage boxes and number of boxes varies by height of bay opening. Samples collected at the Nevada Test Site (NTS) are numbered by Administrative Area Number preceded by an “A” followed by the number of pallets for that area. However, samples collected from tunnels and drifts at Area 12 designate the letter of the particular tunnel following the Administrative Area Number. Samples collected in Nevada, but not at the NTS, are designated as “CNV” (Central Nevada) for samples associated with the Faultless project and by County (Clk, Clark; Nye) for other samples followed by the number of pallets. Samples collected outside Nevada are designated as “AMCH” for samples associated with the Amchitka project in Alaska and by State (Colo, Colorado; MISS, Mississippi; NMex, New Mexico) for other samples followed by the pallet number. Furthermore, a few samples from California, Montana, and New York are simply designated as “basket.”
Sample box number	–	Standard sample boxes are numbered as total per rack bay. The number of storage boxes is normally shown as the total number of standard storage boxes per sample type per hole, but in cases where the storage location is not continuous (usually broken by pallet capacity) the total is shown as the number of boxes on the given pallet or, in a very few cases, storage rack location.
Record location	–	Physical location of rock-sample record.
Hole type	–	Type of vertical or horizontal drilling or excavation.
Hole type	Borehole	Vertical surface location; includes wells and vertical test holes.
Hole type	Crater	Vertical surface location.
Hole type	Drift	Horizontal underground location; includes tunnels and horizontal test holes.
Hole type	Outcrop	Surface location.
Hole type	Shaft	Vertical surface location.
Hole type	Surface	Surface location.
Hole type	Trench	Horizontal surface location.
Hole type	Unknown	Hole type not known.
Tunnel or drift construction station	–	Construction station at collar location (portal opening), for tunnels and drifts (i.e. - 9+17 is 917 ft; 10+72,195’ is a 195 ft hole at the 1,072 ft station; etc.).
Construction station remarks	–	Remarks concerning the portal opening (collar location), for tunnels and drifts (i.e. - In U-12e.14 main drift; Alcove; Face; Invert; Lft Rib; Rt Rib; etc.).
Nevada SPCS Easting NAD27	–	Nevada State plane coordinates (SPCS), Easting, central zone, in feet; North American Datum of 1927 (NAD27).
Nevada SPCS Northing NAD27	–	Nevada State plane coordinates (SPCS), Northing, central zone, in feet; North American Datum of 1927 (NAD27).
Altitude at portal opening NGVD29 (ft)	–	Altitude at the collar location of the portal opening, for tunnels and drifts; in feet above mean sea level; National Geodetic Vertical Datum of 1929 (NGVD29).

Table A1. Description of Rock-Sample Database column contents.—Continued

[**Abbreviations:** DOD, U.S. Department of Defense; DOE, U.S. Department of Energy; NTS, Nevada Test Site; NWIS, National Water Information System; USGS, U.S. Geological Survey; ft, foot; –, not applicable]

Column heading	Column code	Column explanation
Bearing from portal opening (degrees)	–	Bearing from the portal opening, for tunnels and drifts; in degrees, minutes, and seconds or decimal degrees (i.e. - S0720958W is South, 72 degrees, 9 minutes, 58 seconds West; N0325529E is North, 32 degrees, 55 minutes, 29 seconds East; N052.75W is North 52 and three-quarter degrees West; etc.)
Inclination from portal opening (degrees)	–	Inclination from the portal opening, for tunnels and drifts; in degrees, minutes, and seconds or decimal degrees (i.e. - 0045825 is a hole 4 degrees, 58 minutes, 25 seconds above horizontal; 2700000 is a vertical hole below horizontal; 0900000 is a vertical hole above horizontal; 0000000 and 1800000 are horizontal holes; 0150000 and 1650000 are holes 15 degrees up (above horizontal); 3150000 and 2250000 are holes 45 degrees down (below horizontal); 356.5 is a hole 3 and one-half degrees below horizontal; 170.25 is 9 and three-quarter degrees above horizontal; etc.). Inclinations are linked to bearings, so values near horizontal for holes bearing north or east would be added to zero for holes inclined above horizontal and subtracted from 360 for holes below horizontal; conversely, values near horizontal for holes bearing south or west would be subtracted from 180 for holes inclined above horizontal and added to 180 for holes below horizontal.
Altitude of land surface NGVD29 (ft)	–	Altitude of land surface within a reasonable proximity of the site; in feet above mean sea level; National Geodetic Vertical Datum of 1929 (NGVD29). This is an average of the surrounding ground-surface elevation. If the original surface has been altered, estimate the altitude based on nearby unaltered terrain.
Altitude method	–	Method used to determine altitude of land surface.
Altitude method	A	Altimeter.
Altitude method	D	Differentially corrected Global Positioning System (DGPS).
Altitude method	G	Global Positioning System (GPS).
Altitude method	L	Level or other surveying method.
Altitude method	M	Interpolated from topographic map [report accuracy as ± one-half the contour interval (or supplementary contour interval) specified on the quadrangle].
Altitude method	N	Interpolated from digital elevation model (DEM).
Altitude method	R	Reported.
Altitude method	U	Unknown.
Altitude accuracy	–	Altitude accuracy; in feet (decimal values for accuracies less than 1 ft).
Altitude accuracy	U	Unknown.
Site completion date	–	Date hole construction completed.
Hole depth (ft)	–	Hole depth; in feet below land surface for boreholes and shafts; in feet from portal opening for tunnels and drifts.
Redbook hole number	–	Redbook hole numbers are currently assigned to new holes completed at the NTS by National Security Technologies, LLC (NSTec). Entries are listed in **bold** type where sites are located in areas other than the hole name implies.
Redbook hole number	–	Redbook hole numbers listed in the Raytheon Services Nevada (RSN) Nevada Test Site Drilling and Mining Summary (last updated 12-31-90) and previously in the Fenix and Scisson of Nevada NTS Drilling and Mining Summary (last updated 6-30-89; formerly Fenix and Scisson, Inc.) were assigned according to the type of hole drilled or mined, site location (NTS area), and sequence code for the consecutive order in which the hole was drilled, mined, or recompleted. Emplacement holes for nuclear weapons tests begin with the letter U, followed by a dash (-), NTS area number (fig. 1), and sequence code (letters a-z, aa-az, ba-bz, …, za-zz). Exploratory holes follow the same naming convention as emplacement holes, but begin with the letters UE. Holes that begin with the letter U but were drilled or mined specifically to provide data that could not be collected from an emplacement hole follow the emplacement hole naming convention, but are assigned incremental letters or numbers, or both following the sequence code. The suffix letters indicate: [#, satellite hole; CH, cable hole; Ex. or Expl., exploratory hole; HTH, hydrologic test hole; Inst., instrument hole; ITS, integrated test system; PPS, pre-postshot hole; PS, post-shot hole; RNM, radionuclide migration hole; RWMS, radioactive waste management site; and S, substitute hole]. There are numerous exceptions to the standard naming convention. The prefix letters indicate: [HTH, hydrologic test hole; J, Jackass Flat; and RNM radionuclide migration]. Numbers and letters following the dash in the exceptions represent sequence of site drilling or mining, not NTS location. Hole type also is commonly listed after the hole designation. For example: [Access Shaft; Cable Hole; Expl. Hole; Instrument; LOS (Line Of Sight) Drift; Sidetrack; Reentry Mining; Tunnel; Vent Hole; and Zero Station].

Table A1. Description of Rock-Sample Database column contents.—Continued

[**Abbreviations:** DOD, U.S. Department of Defense; DOE, U.S. Department of Energy; NTS, Nevada Test Site; NWIS, National Water Information System; USGS, U.S. Geological Survey; ft, foot; –, not applicable]

Column heading	Column code	Column explanation
Redbook hole number	–	USGS DOE project-related holes in Central Nevada follow a similar naming convention. However, emplacement holes begin with the letters UC and exploratory holes begin with the letters UCE.
Redbook hole number	–	USGS Yucca Mountain Project (YMP) holes at the NTS follow the exploratory hole naming convention. Offsite YMP holes begin with the letters USW to indicate underground southern Nevada waste. The suffix letters indicate: [G, geologic hole; GA, geologic angle hole; GU, geologic unsaturated zone hole; H, hydrologic hole; MX, missile-experimental hole (drilled for U.S. Air Force [USAF] MX Missile-Siting Investigation); N, neutron hole; p, Paleozoic or pre-Tertiary hole; RF, repository facility hole; UZ, unsaturated zone hole; V, volcanic hole; VSE, vertical shelter exploratory hole (drilled for USAF MX Missile-Siting Investigation); and WT, water table hole].
Redbook hole number	–	Environmental Restoration Program (ERP) holes at the NTS begin with the letters ER, followed by a dash, NTS area number (fig. 1), a dash, and an incremental sequence number. The NTS area number is replaced by suffix letters for ERP holes located offsite. The suffix letters indicate: [EC, area at the USAF Nellis Air Force Base Range (NAFBR) where the holes were drilled; and OV, Oasis Valley].
Redbook hole number	–	LLNL Containment Program Data Base hole names are 10 characters in length. The first character identifies the site location of the hole: [U, Nevada Test Site; C, Central Nevada Test Site; A, Amchitka Test Site; and O, offsite hole]. The second and third characters identify either the right-justified Area number for an NTS hole, or the two-letter State abbreviation (U.S. Postal Service abbreviation) for an offsite hole: [U 2, NTS hole in Area 2; U20, NTS hole in Area 20; and ONV, offsite hole in Nevada]. The fourth character is reserved for specially defined areas at the NTS: [U 9I, NTS hole in Area 9, in the ITS area]. Characters 5-10 identify the hole complex or group of holes (of different types) related to the emplacement hole. This may include letters or numbers. For an NTS hole, the fifth and sixth characters are alphabetical descriptors and usually complete the common hole name for an emplacement hole: [U 2 c, NTS hole in Area 2; U 2 ca, NTS hole in Area 2, drilled after U 2 c; and U 2 cb, NTS hole in Area 2, drilled after U 2 ca]. For offsite holes, these characters will indicate county name, on a limited space basis: [ONV NYE, offsite hole in Nevada, Nye County; and OCO RBL, offsite hole in Colorado, Rio Blanco County]. These characters also may indicate project identifiers: [U 1 RNM, NTS hole in Area 1, Radionuclide Migration Program; and U 12 ER, NTS hole in Area 12, Environmental Restoration Program]. LLNL Containment Program Data Base hole types are: [A, access; B, rad chem; C, core; D, Waterways experiment Station (WES); E, exploratory; F, tunnel; G, auger, crack investigation; H, emplacement (H A or H B is a centerpunch emplacement hole); I, instrument; J, PINEX or LOS; K, escape; L, cable; M, hydrologic test hole; N, tracer and sample, foil recovery; O, tunnel dynamics; P, post test; Q, seismic, high explosive; R, re-entry (R-S is a reentry shaft); S, shaft (W/S is a whipstock hole); T, test hole (many types); U, post-test hole, in crater; V, vent; W, water supply; X, pre-post test; Y, abandoned; Z, waste storage; 1, rack assembly; 2, dump; 3, oil well; 4, gas well; 5, geothermal well; and ?, unknown hole type]. Multiple uses of a hole are indicated by consecutively adding hole type abbreviations in this field. If the hole is closely associated with another hole, or if it also is known by another name, this is indicated by /____. For example, the hole name: [U 2 bt HE/U2BU H] means that U 2 bt was initially an emplacement hole that became an exploratory hole. U 2 bt also is an exploratory hole for the nearby emplacement hole U 2 bu.
Former or other hole name	–	Former or other names utilized for holes.
NWIS agency code	USGS	USGS NWIS code to indicate the reporting agency. All sites currently populated in the rock-sample database are assigned as USGS.
NWIS site identification number	–	USGS NWIS site identification number.
NWIS site identification number	–	Downstream order numbers are assigned for surface-water, on-stream, sites. The first two digits of the station number indicate the part or major drainage system formerly used for USGS Water-Supply Papers entitled “Surface Water Supply of the United States” and the remaining digits indicate the downstream order within the part. This site number is left-justified. Although downstream identification numbers have been converted to a variable length format, with up to 14 digits available, 8 digits are normally assigned.

Table A1. Description of Rock-Sample Database column contents.—Continued

[**Abbreviations:** DOD, U.S. Department of Defense; DOE, U.S. Department of Energy; NTS, Nevada Test Site; NWIS, National Water Information System; USGS, U.S. Geological Survey; ft, foot; –, not applicable]

Column heading	Column code	Column explanation
NWIS site identification number	–	Numbering system for sites on open water bodies, off-channel sites, wells, springs, etc., is based on the grid system of latitude and longitude. Although this number is initially determined from the best known latitude/longitude location, plus a 2-digit sequence number for the number of sites located at those coordinates, it retains no locational relevance once the site is created in the database. The overall designation consists of 15 digits. The values of latitude and longitude are updated as better coordinates become available, and should always be used for locating sites or plotting locations.
Latitude NAD27	–	Latitude; in degrees, minutes, and seconds [two digits are available for decimal seconds]; North American Datum of 1927 (NAD27).
Longitude NAD27	–	Longitude; in degrees, minutes, and seconds [two digits are available for decimal seconds]; North American Datum of 1927 (NAD27).
Location method	–	Method used to determine latitude and longitude coordinates.
Location method	C	Calculated from land net.
Location method	D	Differentially corrected Global Positioning System (DGPS).
Location method	G	Global positioning system (GPS), uncorrected [Standard Positioning Service (SPS) and Precise Positioning Service (PPS)].
Location method	L	Long-range navigation (Loran) system.
Location method	M	Interpolated from map.
Location method	N	Interpolated from digital map.
Location method	R	Reported.
Location method	S	Transit, theodolite, or other surveying method.
Location method	U	Unknown.
Location accuracy	–	Accuracy of latitude and longitude coordinates.
Location accuracy	H	Hundredth second.
Location accuracy	1	Tenth second.
Location accuracy	5	Half second.
Location accuracy	S	Second.
Location accuracy	R	Three seconds.
Location accuracy	F	Five seconds.
Location accuracy	T	Ten seconds.
Location accuracy	M	Minute.
Location accuracy	U	Unknown.
Decimal latitude NAD83	–	Latitude, in decimal degrees [automatically generated by the NWIS system software]; North American Datum of 1983 (NAD83).
Decimal longitude NAD83	–	Longitude, in decimal degrees [automatically generated by NWIS system software]; North American Datum of 1983 (NAD83).
UTM Easting NAD27 (meters)	–	Universal Transverse Mercator coordinates, Easting, zone 11, in meters; North American Datum of 1927 (NAD27).
UTM Northing NAD27 (meters)	–	Universal Transverse Mercator coordinates, Northing, zone 11, in meters; North American Datum of 1927 (NAD27).
Remarks	–	Pertinent remarks pertaining to the rock sample.
Date record last updated	–	Date of data entry (compiled into electronic format) is listed if a row of record has not been modified. The date of last (most recent) update is listed if a row of record has been modified. This date does not indicate which columns of data have been modified; only that records have been updated within a particular row. Dates are listed as yyyymmdd (4-digit year; 2-digit month; 2-digit day).
URL address	–	Link to online website and database.